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Koppers Coal Gas Plant at WINNIPEG

We are pleased to announce the receipt of a contract from the Winnipeg Electric Railway Company covering the design and erection of a Koppers Coal Gas Plant to consist of 17 gas ovens of Koppers Improved (Becker) Type, having a capacity of 6.8 tons of coal per charge, together with a Koppers producer and coal and coke handling equipment.

This plant will embody the latest developments in coal gas manufacture. The ovens will be underfired with producer gas, but, if desired, can be heated with blue gas or oven gas. Provision has also been made for steaming of the ovens. The ovens are designed to operate on a normal coking time of twelve hours, which can be reduced to eleven hours or increased as desired, permitting of the greatest flexibility in the production of gas and coke.

This is the third Koppers Coal Gas Plant contracted for during 1923, the other two plants being located at Battle Creek, Michigan, and Zilwaukee, Michigan, respectively, and is a further indication of the increased confidence of the gas industry in the Koppers Company's ability to serve it.

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American Gas Journal

SIXTY FIFTH YEAR

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The Fuel of the Future--What Shall It Be?

IV. Combustion of Gas. The Chemistry of Gaseous Combustion

Ismar Ginsberg

IT has been mentioned in the previous article that combustion is a chemical process, resulting from the combination of the combustible with oxygen. Combustion is in reality rapid oxidation. The combustible matter is induced to burn by being brought to such a temperature that oxidation takes place with great rapidity, evolution of a large amount of heat and the manifestation of flame. The temperature at which a fuel will ignite and oxidize in this manner, that is, the ignition temperature, must be maintained during the entire duration of the burning; otherwise, the fuel ceases to burn. Thus, a coal fire will gradually go out, if the conditions within the furnace are not proper for maintaining the mass of fuel at its ignition temperature. A certain amount of fuel is always consumed in keeping the combustible at this temperature. In the case of gas there is no, or very little, fuel value lost in this way, due to the fact that gas has a low ignition temperature and can be ignited by the heat of a burning match.

Combustible Elements in a Fuel

There are generally three combustible elements that are found in fuels, namely carbon, hydrogen and sulphur. Sulphur is really an impurity and is found in small proportions only in coal, and need not, therefore, be considered in this study. Coal is composed of hydrogen and carbon. Part of the carbon in coal is found in the uncombined state and part combined with hydrogen. Gas contains hydrogen and carbon in the form of hydrocarbons, that is, combinations of carbon and hydrogen, Methane, CH_4, ethylene C_2H_4 and various other hydrocarbons are found, both in natural and in manufactured gas. Carbon is also found combined with oxygen in combustible form, as carbon monoxide. The rest of the constituents of gas do not have any fuel value and are present in the same form in the products of combustion as in the original gas.

So, in studying the chemistry of the combustion of gas, what must be considered is the burning of carbon and hydrogen in the various forms in which these elements may occur. One fact must be fixed right at the outset, and that is that the absolute quantity of heat, which is evolved during the combustion of the substance, always remains constant, the time duration of the burning notwithstanding. Thus one pound of carbon will always give the same quantity of heat when completely burnt, no matter how long the burning process may be. On the other hand, the temperature of the gases of combustion will be materially affected by the time consumed in burning the fuel.

Equations of Combustion

The equations of combustion show in graphical form what happens when the combustible unites with oxygen. Each combustible compound possesses its own equation of combustion, but for our purpose only half a dozen need be considered. The first of these equations represents the complete combustion of carbon, the second equation the incomplete combustion of carbon to carbon monoxide, the further combustion of which is shown in equation 4. Equation 3 shows the combustion of hydrogen to water, while 5 and 6 show respectively the combustion of methane and ethylene to carbon dioxide and water.

1. $C + O_2 = CO_2$
carbon oxygen carbon dioxide.
12 32 44

2. $2C + O_2 = 2CO$
carbon oxygen carbon monoxide.
24 32 2x28

3. $2H_2 + O_2 = 2H_2O$
hydrogen oxygen water.
2x2 32 2x18

4. $2CO + O_2 = 2CO_2$
carbon-monoxide 2x28, oxygen 32, carbon dioxide 2x44.

5. $CH_4 + 2O_2 = CO_2 + 2H_2O$
methane 16, oxygen 2x32, carbon dioxide 44, water 2x18

6. $C_2H_4 + 3O_2 = 2CO_2 + 2H_2O$
ethylene 28, oxygen 3x32, carbon-dioxide 2x44, water. 2x18

The figures underneath each member of the equations indicate the number of parts of each substance that takes place in the burning reaction. Thus from equation 1 it is evident that 12 parts of carbon will burn with 32 parts of oxygen to give 44 parts of carbon dioxide under the condition of complete or perfect combustion. It is then a simple matter to calculate the quantity of oxygen that is required to burn one pound or one thousand pounds of carbon, as each part of carbon requires 2.66 parts of oxygen for complete combustion. The same calculation can be run through with the other combustibles in the aforementioned equations. In converting the figures to air it is only necessary to remember that in every cubic foot of air there is approximately one part of oxygen to four parts of nitrogen by volume. More accurate figures for the volumetric composition of air are 79.2 per cent nitrogen and 20.8 per cent oxygen. To convert the cubic feet figures into pounds it is only necessary to multiply the cubic feet of air by 0.076 (the weight of one cubic foot of air), which will give the weight of the same in pounds.

Calculation of Air Required for Burning Gas

The average manufactured gas has the following composition: methane 40 per cent, ethylene 4.0 per cent, carbon dioxide 0.50 per cent, carbon monoxide 6.00 per cent, hydrogen 46.00 per cent, oxygen 0.50 per cent, nitrogen 1.50 per cent, and water vapor 1.50 per cent. The specific gravity of this gas is 0.39, which means that it is 39 per cent as heavy as air. Thus, if air weighs 0.076 pound per cubic foot, then the gas will weigh 0.39x0.076, or 0.0296 pound per cubic foot.

Oxygen or air must be supplied to burn the methane, ethylene, carbon monoxide and hydrogen that are present in the gas. The other constituents are non-combustible. From the above equations it is easily seen that for each volume of methane there are required for combustion two volumes of oxygen, for each volume of ethylene three volumes of oxygen, for each volume of carbon monoxide half a volume of oxygen, and for each volume of hydrogen half a volume of oxygen.

Inasmuch as it is required to find the number of cubic feet of oxygen or air that must be supplied to the gas to effect its complete combustion, each ingredient of the gas that is combustible may be treated as if it were present alone. Thus, there is 40 per cent of methane in the gas. Then there is just 0.4 of a cubic foot of the gas available for combustion. This volume of methane will then require 0.8 of a cubic foot of oxygen for complete combustion. Similarly, 0.04 cubic foot of ethylene will need 0.12 cubic foot of oxygen, 0.06 cubic foot of carbon monoxide, 0.03 cubic foot of oxygen and finally 0.46 cubic foot of hydrogen will necessitate the presence of 0.23 cubic foot of oxygen in the air that is employed for the combustion of the gas. Thus, the total volume

CONSTITUENTS OF GAS—

No.	Kind of Gas.	CH_4	C_2H_6	C_2H_4	CO_2	CO	H_2	O_2	N_2
1	Natural Gas (Mid-Continental)	96.00			0.80				3.20
2	Natural Gas (Ohio)	80.50	18.20						1.30
3	Natural Gas (Pennsylvania)	67.60	31.30						1.10
4	Manufactured Coal Gas	40.00		4.00	0.50	6.00	46.00	0.50	1.50
5	Coke Oven Gas	22.60		3.00	3.00	8.70	56.90		5.80
6	Coke Oven Gas	33.95		5.15	2.56	6.08	47.88	0.57	3.84
7	Carburetted Water Gas	20.00		12.05	0.22	25.90	36.50	0.03	3.24
8	Water Gas	2.00			4.00	45.00	45.00	0.50	2.00
9	Theoretical Water Gas					50.00	50.00		
10	Blue Water Gas				3.50	43.40	51.80		1.30
11	Producer Gas (Bitumin Coal)	2.50		6.40	2.50	27.00	12.00	0.30	56.20
12	Producer Gas	4.04		0.65	8.6	16.0	11.35	0.16	59.2
13	Oil Gas	58.30		17.40			24.30		

of oxygen required is 1.18 cubic feet. It has already been stated that the gas contains 0.5 per cent of oxygen. This oxygen is consumed in the burning of the gas and hence so much less oxygen must be furnished for this purpose. In other words, the net amount of oxygen required is 1.18 less 0.005, or 1.175 cubic feet. Inasmuch as air contains just 20.8 per cent of oxygen, it is necessary to divide this figure by 0.208, which gives the final result of 5.64 cubic feet of air for burning one cubic foot of the gas.

Products of Combustion of Gas

Not only is it important to know how much air is required for the combustion of a cubic foot of gas, but it is equally important to be able to figure out how many cubic feet of flue gas are produced in the combustion, assuming of course that the combustion is complete. Such a calculation will give the volume of flue gases that may be expected from the combustion of a given volume of gas, which is a very valuable bit of information in determining the loss of heat in the flue gases and in establishing the design of the furnace which is to be fired with gas, so that the greatest possible amount of heat can be derived from the burning of the fuel. Unless the volume of the gases of combustion is known it is clearly impossible to tell how much heating surface must be provided in the gas-fired furnace or apparatus.

one volume of ethylene will give two volumes of carbon dioxide and two volumes of water vapor. One volume of carbon monoxide gives one volume of carbon dioxide, while two volumes of hydrogen gives two volumes of water vapor. At the temperatures that exist within the furnaces and apparatus using gas as a fuel, the water vapor is present in gaseous form and can be considered as forming part of the volume of flue gases, as it is not condensed until the gases pass out of the chimney. The calculation then assumes the following form:

	Carbon dioxide	Water vapor	Nitrogen
0.40 cubic foot of methane gives	0.40 cu. ft.	0.80 cu. ft.	——
0.04 cubic foot of ethylene gives	0.08 cu. ft.	0.08 cu. ft.	——
0.06 cubic foot of CO gives	0.06 cu. ft.	——	
0.46 cubic feet of hydrogen gives	——	0.46 cu. ft.	——
Present in the gas....	0.005 cu. ft.	0.015 cu. ft.	0.015

This makes a total of 0.545 cubic foot of carbon dioxide, 1.355 cubic feet of water vapor and 0.015 cubic foot of nitrogen. From the previous calculation it was seen that 5.64 cubic feet of air were required for the complete combustion of one cubic foot

PER CENT BY VOLUME.

H_2O Vapor	Specific Gravity	Cu. Ft. Air for combus.	Cu. Ft. Gas B. T. U. 60 F. Gross.	Net B. T. U. per Cu. Ft. of Gas.	Products of Combustion per Volume of Gas. CO_2	H_2O Vapor	N_2	Total	Ultimate % CO_2	Net B. T. U. per Cu. Ft. of Air-Gas Mixture.	Net B. T. U. per Cu. Ft. of the Products of Combustion.	Theoretical Flame Temperature of.
	0.57	9.17	967	873	0.968	1.920	7.28	10.17	11.7	85.9	85.9	3300
	0.65	10.70	1131	1025	1.170	2.160	8.50	11.83	12.1	87.7	86.6	3325
	0.71	11.70	1232	1120	1.300	2.290	9.26	12.85	12.3	88.3	87.3	3340
1.50	0.39	5.64	636.6	570	0.545	1.350	4.49	6.39	10.8	86.0	89.5	3410
	0.38	4.18	489.6	433	0.400	1.080	3.35	4.83	10.7	83.6	89.5	3415
	0.41	5.28	600.0	538	0.529	1.260	4.21	6.00	11.2	85.6	89.6	3420
(C_6H_6) 2.00	0.59	5.84	673.0	621	0.822	1.066	4.65	6.54	15.0	90.8	95.0	3480
(H_2O) 1.50	0.50	2.32	313.0	288	0.510	0.505	1.87	2.89	21.4	86.8	99.7	3520
	0.52	2.39	325.0	300	0.500	0.500	1.89	2.89	20.9	88.5	104.0	3620
	0.52	2.28	310.0	285	0.469	0.518	1.81	2.79	20.5	87.0	102.0	3565
	0.87	1.22	157.0	148	0.328	0.178	1.53	2.03	17.6	66.8	73.0	2860
	0.897	1.13	140.	130	0.299	0.207	1.49	2.00	16.7	61.0	65.0	2625
	0.51	8.65	943.0	857	0.931	1.757	6.85	9.54	12.0	88.8	90.0	3420

The same equations that were used in the previous calculation are employed in this one. In this case, however, it is not necessary to convert the volumetric figures into weight figures, as it is possible to carry out the calculations without doing this. The calculation is somewhat simplified in this manner, thus from the methane equation it is obvious that one volume of methane gives one volume of carbon dioxide and two volumes of water vapor; similarly of the gas. Of this 79.2 per cent is nitrogen, which gives 4.475 cubic feet of nitrogen, which is also found in the flue gases. Thus the total volume of nitrogen is 4.49 cubic feet. This makes a total of 6.39 cubic feet of combustion gases for every cubic foot of gas burnt. If it is desirous to find the weight of the combustion gases, it is necessary to multiply each gas—carbon dioxide, water vapor and nitrogen—by their corresponding weights per cubic foot.

The Heat Value of a Fuel

The next step is to determine the heat value of the fuel, that is, the number of B.t.u's. that are contained in it and that can be evolved by its combustion. There is, of course, a great difference between the quantity of heat in a fuel and the proportion of that heat that can actually be utilized to useful purpose. This depends to a certain extent on the construction of the apparatus in which the fuel is burnt and the heat utilized as well as to a large degree on the nature of the fuel itself.

The measurement of the heat contained in a fuel is called calorimetry. It is possible to burn a certain, definite volume of gas, for example, in a device termed the calorimeter, and to measure the heat generated during combustion by absorbing the same in a body of water. When the heating value of gas is determined in this manner the maximum heat developed by the combustion is established, as the products of combustion are cooled down to the room temperature. It is apparent that in actual practice no such thorough utilization of the heat, obtained from burning coal or gas, is possible, as the flue gases from furnaces and gas burning apparatus are practically always hotter than 212 degrees F, the boiling point of water.

Gross and Net Heating Values

Inasmuch as nearly every fuel contains hydrogen, which in burning gives water, there are two heat values possible, one taking into account the heat in the steam and the other not. When water is vaporized a certain amount of heat is absorbed in the form of latent heat. This heat would be given up again if the products of combustion were cooled below 212 degrees F and the water condensed. But this seldom happens in practice. So, because this heat is not utilized, the gross heating value, which is obtained as detailed above, is sometimes corrected by subtracting from it the heat required to transform the water, produced from the combustion of the hydrogen, into vapor. This gives the net heating value. The gross heating value can always be determined from the net heating value by finding the weight or volume of water that is produced in the combustion of a unit weight or volume of fuel and multiplying the same by the latent heat of steam. This figure is then added to the net heating value to obtain the gross heating value. The latter figure is the more preferable of the two, for it tells us just how much heat there really is in the fuel without specifying that some of this heat can only be utilized under special conditions. For that matter, the sensible heat in the combustion gases is never entirely utilized and hence in order to obtain any true conception of the combustion efficiency of a fuel it is necessary to base the calculation on the total amount of heat that is developed by its combustion.

Calculation of the Heating Value of a Fuel

The heating value of a fuel can be calculated from its composition. All that is necessary is to have an exact analysis of the fuel and the heating value per unit weight or volume of the ingredients. Thus, using the sample gas that has been referred to above in several instances, we are able to calculate the heat of combustion of the gas in the following manner: In every cubic foot of that gas there are present 0.4 cubic feet of methane, 0.04 cubic feet of ethylene, 0.06 cubic feet of carbon monoxide and 0.46 cubic foot of hydrogen. These make all the combustible ingredients of the gas. Each ingredient is then multiplied by the B.t.u. factor, the number of heat units developed per cubic foot in complete combustion of the gas. Thus, we have

	Per cu. ft.
Heat from methane.....	0.4x1009=403.6 B.t.u.
Heat from ethylene.....	0.04x1588= 63.52 B.t.u.
Heat from carbon monoxide.	0.06x 324= 19.44 B.t.u.
Heat from hydrogen.....	0.46x 326=149.96 B.tu..
Total heat value of gas.....	=636.52 B.t.u.

Specific Heat of Substances

Every substance possesses thermal capacity. Thermal capacity simply refers to the manner in which the substance behaves on heating. It is really an indefinite expression, just as seating capacity, unless defined in specific terms, and, when so defined, it is generally called specific heat. Specific heat is simply a ratio, telling how many heat units are required to effect the same change in temperature in a similar mass of substance as compared with water. A British thermal unit will raise the temperature of a pound of water one degree Fahrenheit, but it will raise the temperature of a pound of iron 8.6 degrees F; in other words, the specific heat of iron is 0.116, if that of water is unity. Specific heat varies with the temperature, and so, in making calculations, an average specific heat must be employed.

If we are to melt 1,000 pounds of aluminum, it must first be heated to the melting temperature from its original temperature. If the latter is 60 degrees F, then, as the melting temperature is 1214 degrees F, the mass of metal must be heated 1154 degrees F. If the substance were water, and the specific heat was considered as unity, then 1154 B.t.u's. would be required for the purpose. But the specific heat of aluminum is, however, 0.2185, that is, it requires only 0.2185 part of the heat necessary to heat up a similar weight of water. Thus, the heat required in this instance is 0.2185x1154, or 252 B.t.u.

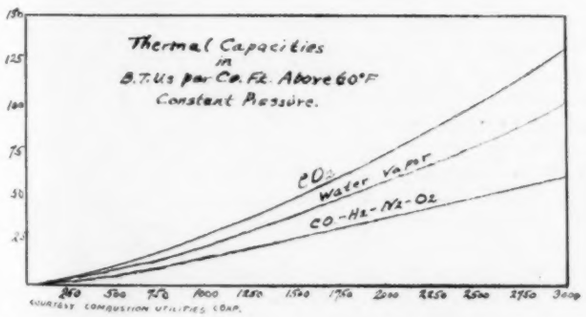
After the metal is obtained at the melting point, it will not melt unless additional heat is fed to it, so as to compensate for the latent heat of fusion which must be absorbed by the metal at the fusion temperature in order for it to be converted into the liquid condition. It requires 160 B.t.u.'s. for every pound of metal to bring this about. Thus, for 1,000 pounds of aluminum, it will take 160,000 B.t.u. and the total heat needed to melt 1,000 pounds of aluminum with an original temperature of 60 degrees, then becomes 160,000 plus 252, or 160,252 B.t.u. This heat must be supplied before it is possible to melt the metal.

Specific Heat of Gases.

Gases, as well as liquids and solids, also possess specific heat. However, due to the fact that the volume of the gas can be changed by varying either the temperature or the pressure, the specific heat of the gas can vary in two ways. In other words, there

are two kinds of specific heat of a gas, the specific heat at constant pressure and the specific heat at constant temperature. The former is the more important in connection with combustion calculations. In the case of gases, as well as in that of solids, it is necessary to adopt a mean specific heat to apply to the temperature range within which the gas is heated. From the standpoint of the combustion of gas, the important specific heats are those of carbon dioxide, water vapor, carbon monoxide, hydrogen, nitrogen and oxygen. When the specific heats of these gases are known for various ranges of temperature, it becomes possible to calculate the heat in the products of combustion of gas under different temperature conditions.

The curve diagram, which is appended, shows the B.t.u's. per cubic foot of the aforementioned gases at different temperatures. This is a very useful curve, as with its aid it is possible to determine the heat in gases of combustion at different temperatures, provided the percentage composition is known. Thus, in the case of the sample gas, which has been used above for various calculations, it was found that the products of combustion consisted of 0.545 cubic feet of carbon dioxide, 1.355 cubic feet of water vapor and 4.49 cubic feet of nitrogen for every cubic foot of gas burned.



Using the Curve Diagram

Suppose it were necessary to maintain a temperature of 1500 degrees F with the gas, from which the above products of combustion were derived. This temperature would be sufficient to melt aluminum and keep it at a high enough temperature above the melting point, so that the melt would not freeze in casting. From the aforementioned curve the heat in the gases at this temperature is found to be as follows, in each case the curve value being multiplied by the cubic volume of gases obtained:

Carbon dioxide	50x0.545 or	27.25 B.t.u.
Water vapor	40x1.355 or	54.25 B.t.u.
Nitrogen 27.5x4.49	or	122.00 B.t.u.

This makes a total of 203.50 B.t.u. per cubic foot of combustion gases that leave the heating apparatus, in which the aluminum is melted. In other words, this amount of heat is lóst in the flue gases. A simple calculation will give the percentage loss on the original heating value of the gas, which was found to be 636 B.t.u. per cubic foot. Thus, 203 times 100 divided by 636, or 32 per cent of the heat that is supplied to the melting furnace in the form of gas must be lost unless some means are at hand for recovering this heat from the flue gases.

Means Specific Heat of Gases

The specific heat of gases, maintained at a constant pressure, may be expressed in the form of equations in which a temperature correction is indicated which must be added to the specific heat of the gas at 32 degrees F and atmospheric pressure.

Thus the specific heat of water vapor is:

0.021+0.000005t B.t.u. per cubic foot up to 3600 degrees F.
0.42+0.000006t B.t.u. per pound up to 3600 degrees F.

For carbon monoxide:
0.089+0.0000009t B.t.u. per cubic foot up to 3600 degrees F.
0.2405+0.0000119t B.t.u. per pound up to 3600 degrees F.

For carbon dioxide:
0.023+0.000008t B.t.u. per cubic foot up to 3600 degrees F.
0.19+0.00006t B.t.u .per pound up to 3600 degrees F.

For nitrogen:
0.0189+0.0000009t B.t.u. per cubic foot up to 3600 degrees F.
0.2405+0.0000119t B.t.u. per pound up to 3600 degrees F.

For oxygen:
0.0189+0.0000009t B.t.u. per cubic foot up to 3600 degrees F.
0.2104+0.0000104t B.t.u. per pound up to 3600 degrees F.

For hydrogen:
0.0189+0.0000009t B.t.u. per cubic foot up to 3600 degrees F.
3.370+0.00017t B.t.u. per pound up to 3600 degrees F.

If, for example, it is desired to find the specific heat of hydrogen at 1000 degrees F, then the equation becomes 0.0189+0.0000009 (1000-32) or 0.0189+0.00087, making the new specific heat 0.01977.

Due to the fact that the volume of gas is generally taken as standard at 60 degrees F, it is necessary to make a further correction in the specific heat, thus found, in order to convert it to the standard volume. This is generally done by multiplying the specific heat found, thus 0.01977 by the factor 0.946. This factor is obtained by simplifying the ratio (460+32) divided by (460+60). The new specific heat will then become 0.01977x0.946 or 0.01869 B.t.u. per cubic foot. The same calculation is carried out in finding the B. t.u. per pound of gas.

Fixed Capital Records

Report of 1923 Committee

System of Records---Discussions of Items of Cost

H. J. LaWall, Chairman

The United Gas Improvement Co., Philadelphia, Pa.

The following report was presented before the Thursday meeting of the Accounting Section of the American Gas Association assembled in Convention at Atlantic City.

THE COMMITTEE on Fixed Capital Records for 1923 was organized in the fall of 1922, being a continuation of the committee first organized in 1921 under the name of "Committee on Continuous Inventory of Fixed Capital."

Preceding Committees

The 1921 Committee made a canvass of the larger member-companies to ascertain the method in use for keeping detailed construction records and to learn the attitude of these companies toward maintaining a Continuous Inventory of Fixed Capital.

The 1922 Committee made a further study of the subject, covering the definition and advantages of maintaining a continuous inventory, and presented a general outline for installing a workable system.

Outline of Work for Year 1923

At the first meeting held in New York City in December, 1922, the Committee outlined the work to be undertaken this year as follows:

1. To procure descriptions of several systems of keeping fixed capital records in use by some of the member-companies, together with all forms used in connection therewith.

2. To make a complete list of the so-called indirect or undistributed items of cost, prepare a discussion of these items and their relation to Fixed Capital and recommend a method of distributing these elements of cost to individual projects in order that they may become a part of the Fixed Capital.

3. To design a model system of Fixed Capital Records, with forms, together with a complete description of their use and instructions for maintaining such a system.

In oder to facilitate the work and get the most efficient results the Committee was divided into sections or groups. The Western Section under the leadership of Mr. F. L. Conrad, was assigned the work of designing a model system as outlined under "3" above. Messrs. A. C. Klein and C. A. Schlegel were assigned the work of writing a discussion on the indirect or undistributed items of cost entering into Fixed Capital as outlined under "2" above. The other members of the Eastern Section of the Committee undertook the work of procuring descriptions of systems pertaining to Fixed Capital as outlined under "1" above.

Remarks on the Reports by the Sub-Committees

The work outlined has been completed and is made a part of this report in the following order:

Description of a System of Fixed Capital Records now in use by the St. Paul Gas Light Company of St. Paul, Minn., by Mr. T. L. Nelson.

Discussion of Indirect or Undistributed Items of Cost, by Messrs. A. C. Klein and C. A. Shlegel.

Proposed System of Fixed Capital Records with Forms, by Mr. F. L. Conrad.

Supplementary Fixed Capital Record Forms, by Mr. E. L. Heyser.

Several systems actually in use, of keeping Fixed Capital Records, were studied by the Committee, but there is submitted in this report only one, which the Committee felt was in such detail as to be helpful to the member-companies and to show the strides that are being made by companies in this direction. The other systems submitted were, however, helpful to the Committee in arriving at its conclusions. In this connection the Committee desires to thank the companies who have submitted data and forms for their cooperation.

It will be noted in connection with the St. Paul system that field engineers are held responsible for the accuracy of the information submitted to the Fixed Capital Records Division. The Committee feels that in any system installed or to be installed at least one engineer be made part of the personnel necessary to maintain the record in its entirety.

The Committee has confined its discussion to the so-called overhead, general, indirect or undistributed items of cost of the tangible property. Heretofore, these items have not generally been given proper consideration by many of the public utilities, in the matter of charging the proper proportion to capital, and it is the earnest hope of the Committee that this report may be found helpful to the companies in their consideration of this subject.

The proposed methods for keeping Fixed Capital Records, included in this report, do not embody the perfect system that the Committee would like to see incorporated herein. Perfecting a system in the time allotted was found to be a physical impossibility. In addition to this fact it was the unanimous opinion that no system could be designed to take care of all the requirements of every company. In other words, the ultimate system will, no doubt, have to be modified to meet the particular requirements of each company. The system submitted does, however, represent a general scheme and the forms included, together with the description of their use, should be helpful to companies who contemplate the installation of a system of fixed capital records.

Recommendation for the Future

We believe that a Committee should be appointed to carry on the Fixed Capital Records work next year. This Committee by keeping in touch with the systems being installed from time to time would be able to compile information covering the use of such records that would be of great value to the public utilities throughout the country.

Respectfully submitted,

H. J. LaWall, Chairman; F. L. Conrad, H. C. Davidson, E. L. Heyser, A. C. Klein, C. L. Nelson, C. A. Schlegel, E. C. Scobell, L. T. Smith, A. C. Winters, William Wurth.

(The original report contains four articles, which are enumerated above. These articles contained considerable detailed information and numerous illustrations of forms, etc.

The article entitled, Discussion of Indirect or Undistributed Items of Cost, contains a detailed description of the elements of cost of fixed capital tangible property.

A complete set of fixed capital forms is given in the article by F. L. Conrad.

The article on Supplementary Fixed Capital Record Forms by E. L. Heyser contains a detailed description of an entire set of these forms and the methods of using them. Editor).

Report of the Sub-Committee on High Bill Complaints

High caliber men must be used

G. M. Hergesheimer, Chairman

The United Gas Improvement Co., Philadelphia, Pa.

IN treating this subject we hope to make an appeal to gas companies generally to attach greater importance to this class of work. We all agree that the good will of the public is one of a utility's greatest assets; therefore, to properly care for the dissatisfied—the customer with a grievance—is our manifest duty if we hope to attain this good will and meet with that degree of success for which our respective companies are striving.

Probably in no other way can a gas company better learn of a customer's dissatisfaction or grievance, or putting it in another way, probably it is never more evident that dissatisfaction or grievance exists than through the medium of a high bill complaint. Going further, it is only too often found that a troublesome complaint of high bill is really due to a happening or condition, either fancied or real, antedating the high bill complaint by some period of time. The receipt of a bill, perhaps only slightly higher than for the previous corresponding period, results in the customer's relieving his pent-up feelings in no uncertain terms.

Handling High Bill Complaint

Now—how should such matters be handled? The answer in a broad sense is apparent to all of us. First, to select high bill men of attractive personality, combining good appearance and good address, men of infinite tact, patience and judgment, plus (and this is most important) a versatile knowledge of the business. These you say are big qualifications, requiring high grade men. They are, and we feel that gas companies generally must awake to a realization of this fact and give a remuneration commensurate with the work rendered; but bear in mind not all of these qualifications are inherent, many being acquired by a proper course of training. We were taught in our student days that the three principles of science are—Observation, Experiment, and Reason. How fitting these principles are to the trained high bill investigator. Again, we like to think of an examination of a high bill as we were taught to look upon Cause and Effect. Every Effect has a Cause and every Cause an Effect, and so on to the final cause. The high bill is the effect and must have a cause; therefore, the more trained the mind, the more certain of finding the cause.

Meter Test

The act of removing a meter for test is in no sense a cure-all. It may satisfy the gas company, but does not always in itself satisfy the customer. What the customer desires is to ascertain the cause of the increase to make the satisfaction complete. The high bill man, not having supernatural powers, this cannot always be accomplished, but the fact remains that the man properly selected and receiving proper training, can, in a great number of cases ascertain the cause, and where necessary take the proper corrective measures.

A recent editorial in a well-known journal, in treating of public relations, contained a statement that the handling of complaints was the job of an exceptional salesman, as work of this character requires a selling ability of the highest type. One company, dominated by similar views, has for some years designated men in this department as "Service Salesmen," conveying the thought that they are high-grade men understanding their business and selling a commodity. This particular company in extending this policy stated there has been nothing done, including operations, improved machinery, etc., which has had a further reaching and better effect than the establishment of a department which primarily is attorney for the people. This is not heroics or a hysteria, but a payer of material dividends.

Verbal Complaint

Proceeding to the receipt of the complaint, let us assume it is made verbally. The customer should be directed to the portion of the office reserved for this class of work—a place removed from the general order and complaint desk. Here, and not within hear-

ing of another customer who desires to make a like complaint, the case may be discussed by a trained man, with the aid of the gas ledger and any other record deemed necessary. Some cases, usually the minor ones, or where prima facia evidence is sufficient to convince and satisfy the customer beyond a doubt, may be settled then and there, but we are averse to spending much time at this point of contact. The company which strives to settle all its complaints in the office is fooling no one but itself. It is going contrary to the laws of psychology or human nature, call it what you will. A visit to the customer's property and the usual examination and rereading of the meter has a psychological effect of a palliative nature far beyond a discussion at the office. The people may like to be fooled, as has long ago been said, but our customers are not so ignorant as to believe that meter registration may be proven accurate by an office discussion without a visit to the complainant's premises. They may leave the office awed, or apparently satisfied, but in the calm light of day, after reviewing the discussions, the truth is forced upon them that their complaints have not been given proper consideration. This is the beginning of ill will.

Visit to Premises

The high bill man, after being advised of all data, is ready for a visit to the premises and here his real work begins. First impressions are often lasting and mean much; therefore, the manner in which the customer is greeted has an important bearing on the case. It is usually advisable to light a burner at a convenient point, preferably near the meter, then proceed to read and make an examination of the meter. Any leakage should be determined and the consumption computed from the time of the bill reading, together with the daily average consumption, to compare with the average during the period covered by the bill. The latter has a very important bearing on the case, as the increase or decrease in consumption to the date of the visit should guide the high bill man in his course of action. The appliances should be inspected to see that they are functioning properly, and right here may, perhaps, be found a cause for the increase in consumption. In talking with the customer, endeavor to win his confidence, impressing upon him that you are there in a spirit of helpfulness; that it is the company's desire to teach economy in the use of gas so that each customer may obtain proper value for each cubic foot of gas consumed. With confidence inspired, the high bill man is on the road to success. We will assume he has observed closely all conditions affecting gas consumption, then with the customer's confidence gained, he can ask such questions as good judgment and tact will warrant, either as a result of his observation or otherwise. As a result of these observations and questioning, which we will call experiment, the high bill man is in a better position to reason.

No Cut and Dried Method

It might be well to remark at this time that there can be no cut and dried method of handling high bill complaints, no stereotyped line of talk. Broadly speaking, the examination should be along the above-mentioned lines, presenting the conclusions to the customer in the way which will best appeal to each individual, remembering that after all a certain knowledge of human nature is essential to success. The peculiarities of each case must be studied to make the strongest appeal. The road to success in this work can be summarized briefly as so much natural ability plus still greater study and hard work.

Training Men

In training high bill men, meetings should be held where the operation and construction of a meter can be thoroughly explained, where the entire mechanism can be viewed and all questions answered. Further meetings in series should be devoted to the complaint meter; its construction, operation, and function (having a complaint meter set in tandem with an ordinary meter at the time). Appliances should not be neglected in this series of meetings, particularly automatic water heaters, showing and explaining the different types.

The men should be taught proper combustion and adjustment, and to recognize defects. They should be encouraged to ask questions and to submit their problems and their experiences for mutual profit.

Use of Complaint Meter

The complaint meter is usually set in tandem with the house meter, and when so set may be used to a certain degree, besides performing its principal function, to test the accuracy of the house meter. It may also be used on any part of a pipe line, such as a range or water heater line. Sometimes such an installation as this is most advantageous. The high bill man may come to the conclusion, as the result of his investigations, that a certain appliance is used to a much greater extent than the customer realizes. By placing the complaint meter on the line supplying this appliance, the consumption of gas through the particular appliance can be obtained in units of 5 or 20 cubic feet, according to the size of the complaint meter.

Let Customer Witness Test

When changing a meter for special test, it is advisable to offer the customer an opportunity to witness the test, where each step in the procedure can be explained. Few will avail themselves of this opportunity, but even with those who do not, it has a certain psychological effect, showing the company's spirit of fairness and honesty of purpose. However, before changing the meter, it is usually the part of wisdom to give the customer some conception of the meter test and its reliability as a conclusive or positive factor in determining whether the meter registered correctly or incorrectly the amount of gas passing through it.

We have all met with particularly aggravated complaints, involving some unusual features, and where seemingly the customer could not be satisfied. We believe it distinctly advantageous to have a man to specialize in such cases; a man of high calibre and training and of peculiar fitness.

It has often occasioned wonder why such an accurate and reliable device as the gas meter is so much abused. We gas men are to blame for this lack of faith. Neither those who preceded us in the

early days of the industry, or we ourselves have done much to dispel this delusion and acquaint the customer with the true facts concerning the meters as we know them. Neither have we made any concentrated effort to teach customers to read their meters and keep records of the cost of the gas consumed. If this had been done long ago we would not now be reaping the results of the neglect. If this is true, let us make up for the mistakes of the past and build for the future. We all admit that we want our customer's good will and are sincere when we continually preach this doctrine, but we might, to good advantage, analyze ourselves and see if we are really practicing in every way what we preach.

Respectfully submitted,

G. M. Hergesheimer, Chairman; R. F. Bonsall; H. C. Schaper, P. C. McDonald, De Witt Clinton.

Distribution Design Committee Report

Demand problem—Notes on taking pressures, durability of mains

Robert G. Griswold, Chairman

The above report is published in the following abstracted form. It was delivered at the Wednesday Session of the Technical Section of the American Gas Association, assembled in Convention in Atlantic City.

LAST year's discussion of distribution design was devoted almost exclusively to reducing cost of distribution systems. The scheme discussed at that time was criticized in regard to two features.

First, that the design outlined in last year's paper would be entirely inadequate because the demand on which the design was based was inadequate. In other words, it was assumed that the demand was estimated from the demand on the plant, whereas the effect of diversity factor would be to increase the demands on sub-divisions of distribution systems to such an extent that the design outlined would be unable to give service.

The other criticism was that steel mains were so much more susceptible to corrosion that their use would be prohibitive. Your committee has, therefore, given particular attention to these two points.

Demand Problem

In regard to demand, many people have expressed the opinion that, as the distribution system is sub-divided, the effect of diversity factor would be gradually limited so that the demands on small sections of the distribution system would be very much greater per unit of length than on the system as a whole. One way of testing this is from a table in last year's paper giving a list of a number of different gas companies. In this table, Chicago has the greatest number of customers, and has a maximum station demand per customer of 13 cu. ft. per hour. St. Louis has about a quarter as many customers and the maximum demand per customer is 18 cu. ft. Denver has about one-twelfth as many customers and its demand is 16 cu. ft. per hour per customer. Lincoln, Nebraska, and Spokane, Wash., each represent about one-sixtieth of Chicago's system and have 11 and 12 cu. ft. per hour per customer. Lebanon, Pa., represents about one-sixth of 1 per cent of Chicago and has a demand per customer of 19 cu. ft. so that if these smaller companies can be taken as representative of what portions of the Chicago system would show, then sub-divisions of Chicago's distribution system would not show a very marked loss in diversity factor.

Demand Measured

Fortunately, one member of the committee has been able to set meters and actually measure the demand on certain sections of his distribution system. His report of what he found is attached as Exhibit "A." It is interesting to note that the diversity factor applies almost as perfectly on as small a group of customers as 27, as it would on a whole property.

Exhibit "A"

Test No. 1 was made in a strictly residential section adjoining the City Line, and is occupied by families of a mixed class, in most cases being skilled mechanics and office employees, who are demanding gas in their kitchens exclusively in pretty nearly all cases. The main in the street selected is a 2-inch main and is not tied in at both ends, thus enabling the test to be made from one direction. The main was entirely cut off and the gas by-passed through a "60 Lt. B" meter. The number of consumers connected are 34, the number of consumers using gas during the test being 27.

The meter registered a total consumption of 2400 cubic feet for the twenty-four hour period. The readings began at 4:30 on the 4th of April and were for fifteen minute periods up to 5:45 p. m. These five readings show a consumption of 100 cubic feet for each of the 15 minute periods. At no time for the period was the demand greater than this.

This test showed the maximum demand per hour equal to 16 2-3 per cent of the twenty-four hour consumption.

Second Test

Test No. 2 was made at the Village, which is a small town built by the company. This village has a total of 200 separate and distinct dwellings, each one of which is equipped with gas range in combination with a small coal burner on the side, and no doubt, the gas is used in pretty nearly every dwelling exclusively for cooking.

The gas mains throughout the village were laid with a view of further extensions, as this village is to be very much enlarged in the near future. The dwellings are all occupied by employees of the company, they being skilled mechanics, clerks and engineers. "60-Lt. B" meters were used in this test, the gas being by-passed by means of the gas supply being cut off with rubber bags, thus enabling us to pass all gas being used in this village through the meters and test at one time the whole consumption.

On the evening of the test, there were only five dwellings reported as not using gas.

I might add, in connection with this test, that five minute readings were taken to check the consumption down to a smaller period within the fifteen minute periods as shown on the accompanying tables. These five minute readings showed that we were getting in the fifteen minute readings the maximum for any period during the maximum hour.

Third Test

The Test No. 3 was made in a district adjoining the city line and which is very rapidly building up to the ordinary city conditions. In the street tested, there are 68 dwellings, all of which were connected to the main at the time of the test; there were 65 of these dwellings occupied and during the test 54 were using gas. Every one of these dwellings has nothing to cook with but gas. This main, as in the first test, is not tied at both ends, thus making the flow all in one direction.

It is interesting to note that the maximum consumption as shown by these tests during the maximum period never in any case equaled 20 cubic feet.

The three points selected for these tests were chosen because of the fact that the dwellings, in most cases, are new ones, and are equipped for the modern use of gas in the home, with the possible exception of its use for house heating.

Section with Two-Inch Mains

In another city there is a section of the distribution system which has been laid out, using 2-inch mains almost exclusively. This is a bookkeeping district. The total length of mains is about 120,000 feet, of which 85 per cent is 2-inch pipe. The sales in this bookkeeping district in the maximum month were 11,621,000 cu. ft. and there were 2,600 customers, making the monthly sales 4,500 cubic feet per customer. The average sales for the whole company in that month was 3,500 cubic feet per customer, so that the customers in this district are above the average for the company.

The demand in this bookeeping district is somewhat more than 60,000 cubic feet per hour, making the maximum demand per foot of main .50, and the maximum simultaneous demand per customer 24 cubic feet. How great the capacity of these 2-inch mains is cannot be appreciated until we take into account the following conditions:

Pressure Conditions

1. The high pressure in the mains is not necessitated on account of the 2-inch. The high pressure in this case is necessitated by the lack of capacity in the mains larger than 2-inch.
2. Substantially all of the 2-inch is supplied from the larger mains at a very nominal pressure of 4 or 5 inches.
3. For the great majority of 2-inch mains very modest differential pressures prevail; for example, 4 or 5 inches initial to 2 inches minimum.
4. There are a number of househeating installations on these 2-inch mains.
5. If the 6-inch main were replaced with 10-inch, the drop in pressure along this main would be reduced 93 per cent in each case.
6. It has not been necessary to tie the 2-inch together at every cross street or to eliminate dead ends.
7. This district is still largely without service regulators. Those portions, however, suffering from the highest pressures which originated on the 6-inch main feeding the district, have been provided with regulators. Their necessity, however, would disappear if the 6-inch main were replaced with 10-inch and the pressure reduced, as outlined in 5 above.

Comparison with Last Year's Paper

The following table shows a comparison of the principal features of the system outlined in that paper and the actual system shown on this map.

	Last Year's Paper Table 3	Actual
Length of 2" between feeders	4200'	4700'
Minimum pressure on 2"	2"	2"
Minimum feeder pressure	4"	4"
Demand per foot of main	.425	.50

You will note by looking at this table that the distance between feeders is as great as outlined in that table, that the drop in pressure is substantially the same, that the demand per foot is somewhat greater

and therefore that whatever estimates were made regarding diversity factor, in preparing the table in last year's paper, were justified in actual practice.

Another case should be discussed because the analysis we present here will perhaps give some distribution engineers a confidence to use cheaper designs which otherwise, perhaps, they would not feel justified in asserting. In a certain city the demands were estimated from the monthly consumption in four cases as follows:

Case	Demand per Foot of Main
A	1.42
B	1.70
C	2.82
D	5.26

While these demands per foot of main have been estimated, they nevertheless bear about the same relation to the consumption that exists in other cases and are probably about correct. These demands are so much higher than the demand in table 3 of last year's paper that the distribution system described herein would not apply. However, it can be shown as follows that these four cases are not typical of any large part of the distribution system. Since they were estimated from the monthly consumption, we can make the following table from the monthly consumption figures:

Case	Sales per Ft. of Main per Month
A	243
B	293
C	493
D	931
Total Company Average	131

This shows that the four cases selected are all much above the average and if any considerable part of the distribution system is assumed as represented by these four cases, then the balance must have an extremely small sales per foot.

If we assign arbitrary percentages to these four cases we make the following table:

Case	Monthly Cu. Ft. Sales per Ft. of Main	Percentage Represented	Contribution to the Average
A	243	6	14.58
B	293	6	17.58
C	493	3	14.79
D	931	3	27.93
Balance of Co. Calculated	68	18 82	74.88 56.12
Total Company Average	131	100	131.00

This shows that 82 per cent of the distribution system has a monthly sales per foot of main of 68, which is about half the average for the whole company. If the demand per foot of main bears the same relation to the sales in this 82 per cent of the distribution system as in the other 18 per cent, as seems to be reasonable from a study of the table submitted in last year's paper, then the maximum demand per foot for this 82 per cent of the distribution system will be .39 cu. ft. per hour per foot of main, which could certainly be handled on a distribution system like the one outlined on the map referred to above or in last year's paper. Therefore, 82 per cent of this company's distribution system could be built of the cheaper design.

Determination of Demand from Instrument Readings

The determination of demands from actual readings does not seem to be as common to gas men as it should be, the electric distribution men have portable instruments with which in a very short time they can readily read the actual demand in any line. The gas man, however, has been considerably handicapped because he had no such instruments. However, one company has used a method which, while not as accurate as the electrical distribution man's method, is at least accurate enough to give very valuable information. The scheme is to take the drop in pressure on mains and compute from well known flow formulae the hourly rate at which the gas flows. It is open to the objection, of course, that there may be deposits or stoppages in the mains, but for this particular purpose all such stoppages will only tend to make the demand greater than it really is and no abnormal condition could make the readings lower than the actual. The instructions sent out by this company for the taking of such pressure readings are attached to this report. (Exhibit E.)

Exhibit "E"

NOTES ON TAKING PRESSURES

I. The only satisfactory instrument is the "U" Gauge. One advantage of this apparatus is that it is always accurate and another is that the cheapest one is just as accurate as the most expensive ine.

II. It is useless to try to fill the tube just to the zero mark, because:

1. It is very difficult to fill a gauge exactly to a mark and make it stay there.

2. Twice the reading on one leg is not always the same as the sum of the reading on both legs, and the latter is correct.

III. Only water should be used in the tube as other liquids do not give the same reading. For example, when the true pressure is thirty tenths, the gauge using water will show thirty tenths or three inches, while the gauge using kerosene will show from thirty-six to thirty-nine tenths, depending upon the grade of kerosene used, and the temperature, and the gauge using glycerine will show

twenty-three or twenty-four tenths. In case pressures must be read where water would freeze, the gauge should be filled with kerosene or glycerine. After the pressures have been read the gauge should be taken to a warmer place and connected up with a gauge filled with water and by manipulating the pressure, the water pressure corresponding to each reading on the glycerine (or kerosene) gauge can be read off.

Main Pressure at Gas Appliance

IV. Satisfactory main pressures can be taken at the consumer's appliance as follows:

1. The gauge is attached to some idle burner and a reading taken.
2. Then all the other burners are shut off for a moment while a second reading is taken.
3. Then they are re-lighted and the consumer has the use of the appliance.

The first reading will be, say, thirty tenths, and the second reading thirty-three tenths. The second reading is the true pressure in the main. So long as the burners are on as at first the gauge will read three tenths too low, and each reading should be corrected accordingly.

V. In making a careful survey of pressures it is often necessary to take into account the difference in elevation of the several points where the pressure readings are taken. The pressure reading increases one tenth for every fifteen feet of rise. A very convenient way to take care of this is to get the more important street elevations from the city engineer, find the difference in elevation from the gas works and divide by 15. This gives the increase in pressure due to elevation alone.

VI. When the business grows so that too much pressure is lost it is very necessary that a series of pressures be taken along the line of feed from the works. The pressure as it exists at the moment of most rapid flow must be known at each point on the line of feed where the size of main changes, or a large branch is taken off. This information, corrected for the elevation, will often indicate a single block of main where the whole trouble is located.

Obstruction of Mains

VII. In order to know whether a main is obstructed by naphthalene, or scale, etc., it is necessary to know the size, length and pressures, and also the quantity of gas. The proper method of getting the rate of gas flow from the works is as follows:

Read the station meter at intervals, say every fifteen minutes, and at the same time read the height of the holder. If the holder is falling then the amount of gas represented by the fall of the holder between two readings plus the amount of gas registered on the meter for the same interval is the total gas delivered to the mains during that interval. These amounts plotted on cross-section paper make a "load-curve."

VIII. In following up the pressure conditons in a gas main the method described below has given good results. Let it be assumed that the main under discussion runs along Main Street and crosses Avenues "A," "B," "C," etc. Pressures are taken at Avenue "A," where the main leaves some larger main, or the works, and at Avenue "D," where a large branch comes off. A man is stationed at "A" with a gauge and a watch and makes a reading at the hour and every fifteen minutes thereafter during the peak, say, five readings. Another man at "D" with a watch, set by the first one, also reads every 15 minutes and at the same moment as the readings are taken at "A." The "D" pressures subtracted from the "A" pressures give the pressure lost at each fifteen minutes. To the pressure losses must be added the equivalent in difference in elevation as explained in Note "V." This correction should be added to the pressure loss if the gas flows up-hill and subtracted if the gas flows down-hill. The time when the corrected pressure loss is greatest is the time of greatest demand on this main. This may not occur at the same time as the maximum demand on the works.

If it is desired to continue the investigation farther up the main, the men will be stationed at "D" and "G" or "H," the following evening and take a new series of readings. In selecting evenings to take such pressures, it is necessary to eliminate days of light demand, for example, Sundays. It may happen that the tax on the main is most severe on Saturday evening of each week. In that case it may be necessary to take readings at "A" and "D" on this Saturday and at "D" and "H" on the following Saturday.

Effect of Peak Variation

In case the peak hour at the plant varies considerably from day to day it may be necessary to correct the pressure losses to some standard. The pressure losses vary as the square of the rate, but it is sufficiently accurate to say that any change of rate expressed in per cent faster or slower makes the pressure loss increase or decrease just twice as many per cent.

For example: If the rate of flow increases 10 per cent the pressure drop will increase 20 per cent. In the above case if the peak hour was 8 per cent less while the "D" and "H" readings were taken than while the "A" to "D" readings were taken, the pressure losses figured from the "D" to "H" readings after being corrected for elevation would be increased 16 per cent. They would then compare with the "A" to "D" readings.

IX. If the men are not familiar with the methods in Notes IV and VIII, it may be well to put them in adjoining rooms or buildings where the pressures should be the same and see if they get identical readings.

Relative Durability of Mains

In regard to the relative durability of steel and

(Continued on Page 470)

As The Journal Views It

THE GREATER APPEAL

The Gas Convention was primarily of, for and by gas men. But anyone, who attended it, might have remarked that it had a greater appeal; that it had attractions for the layman as well as for those whose main interest is gas. The general public, as they strolled past the Steel Pier and saw the two exhibits, arranged on either side of the main entrance, seemed to be as much attracted by what was going on as the gas men themselves. Aptly enough, these exhibits featured the two main fields into which gas enters, the industrial and the domestic. The industrial field was represented by an exhibit on the use of gas in steel melting, and the domestic field by a model kitchen in which two young ladies were busily engaged in preparing cookies. There was always a crowd of people watching both exhibits.

Then again, on the night that the Pier was thrown open to the public, the crowds that visited the many fine booths, again lent evidence to the fact that there is something interesting and attractive in gas to every man and woman. After all everybody comes in contact with gas and there is much that the housewife or the average man likes to know and should like to know about it. When the value of gas as a fuel and the peculiar intimate bearing, that it has on his daily life is brought to his attention in an attractive manner as in an exhibition, his interest is unfailingly aroused.

This is the greater appeal of the Gas Convention. And it should and must be so, for when all is said and done, the ultimate consumer of gas and gas appliances is the individual whose interest must be excited, whose opinions and knowledge about the workings of the gas industry must be correctly attained and properly formed in order for the gas business to continue the progress that it has made during the past.

Thus the gas exhibition serves a double purpose. It brings together the gas men and allows them to become better acquainted with the progress that is going on in the industry. It also gives the gas industry an opportunity of reaching the ultimate consumer in a forcible, direct appeal. He can see just what the gas industry is doing for his direct or indirect benefit by making a short visit to the booths of the exhibitors. He can attend the various demonstrations and learn further why gas men say, "If it's done with heat, you can do it better with gas."

THE SPIRIT OF THE CONVENTION

The Fifth Annual Convention of the American Gas Association has passed into history. The gas men and their guests have scattered to their homes. The exhibits have been dismantled and the Steel Pier, which verily hummed with life for four days, filled with beautifully arrayed booths, exhibits which were most carefully and conscientiously prepared, is now deserted and stripped of all its finery. The Convention is over. Everybody had a good time. There were many entertainment features. There was much both to see and to learn.

But the spirit of the Convention still lives in the heart of the gas men who spent the few days in Atlantic City in company with their friends and acquaintances. This spirit was markedly manifest while the Convention was taking place. Everybody seemed eager and anxious to give the best that was in him to make the Convention a success. And it was a great success, as any such undertaking must necessarily be when all work together to make it so. At every booth, on the floor of the exhibition rooms, in fact everywhere that a gas man could be found, there was a man who was working with might and main to further the common interests of the American Gas Fraternity. Questions needed only be asked to be anwered with alacrity and cheerfulness. Invaluable information was made public in the meetings of the various Sections, which were addressed not only by gas men but by guests of note from abroad as well as from all over our own country.

None could help but see that living, throbbing spirit of the Convention. It could be recognized in the face of every man and now that the gas men are back at home or on their way there, we would like to feel that this spirit is still alive and will continue to live, doing its invaluable work in knitting together the gas men in a firm, fast union, into an Association which exists for the mutual benefit of every member of the American Gas Fraternity.

DISTRIBUTION DESIGN COMMITTEE REPORT

(Continued from Page 468)

cast iron mains, we find some interesting data. One company reports the following on services:

Service Fittings	Size	No.	
Services Rusted Out	1"	29	
	1¼"	448	
	1½"	11	
	2"	10	
	2½"	1	
	3"	1	
	1¼"	15	
	2"	1	
	2½"	1	
Services Rusted by Electrolysis	1¼"	31	
	1½"	2	
	2"	2	
Services Rusted Out-Soil Corrosion	1¼"	2	
	2"	1	
Stub Services Rusted Out	¾"	2	
	1¼"	3	
Services Broken by Graders	1¼"	8	
	1½"	3	
		571	571
Services Broken at Cock	1¼"	2	
	1½"	2	
Core Loose	1¼"	10	
	1½"	1	
Long Screws Rusted Out	1¼"	3	
	1½"	1	
Nipple on Service Split	1¼"	1	
Service Split in Seam	1¼"	1	
	1½"	1	
		22	22
Street Ells Split	1¼"	3	
	1½"	3	
Street Ells Broken at Main	1½"	4	
Street Ells Rusted Out	1¼"	2	
Street Tee Broken at Main	1¼"	2	
Street Tee Split	1¼"	6	
Plain Tee Rusted Out	1¼"	1	
Plain Tee Split	1½"	1	
		22	22
			615

In this comparison there are 22 leaks out of 615, or 3 per cent in the cast iron portion of the structure and the balance in the steel portion.

Since the service is probably at least 40 feet long and the cast fittings do not represent an actual length of more than 8 inches, it is evident that less than 2 per cent of the service length is of cast material. In other words, this table shows that 3 per cent of the leaks occurred on the cast portion of the service, representing less than 2 per cent of the length of the service. Apparently steel is more durable than cast material. At any rate this certainly does not prove that steel is less durable than cast iron.

From another source we get the following data:

This shows a total of 22,440 feet of 2-inch pipe replaced. Two-inch pipe began to be laid in 1903, and by 1913, 162 miles had been laid. Assuming that the replacements applied to none of the mains laid since 1913, the 22,000 feet represents 140 feet per mile replaced in a period of about seven years, or at the rate of 20 feet annually per mile of 2-inch, which is less than .4 of one per cent.

Check on Data

Any suspicion that this data is incomplete can be tested from the following facts, about which there can be no question.

The total expenditure for street main maintenance for the ten years beginning 1913 was $38,302, or at the rate of $3,830 per year. A part of this expenditure was for maintenance of cast iron mains larger than 2-inch. However, if we assume that it applies only to the 2-inch in service in 1913, namely, 162 miles, we find that this $3,830 per year represents only one per cent on the 162 miles of 2-inch.

From another source we received further data, which showed that 75,000 feet have been renewed in twenty years or an average of less than 4,000 feet per year, with a total length of about 1,300,000 feet, representing an annual replacement of less than .3 or 1 per cent per year.

Exhibit "F"

The total length of steel and wrought iron pipe in our main system totaled on January 1st, 1923, 1,299,987 feet. You will note by reference that the pipe removed since 1903, due entirely to electrolysis, totals 27,646 feet, which is a little more than 1 1-3 per cent of the total steel and wrought iron pipe in use on January 1st, 1923.

Referring to the pipe removed due to other causes than electrolysis it will be noted that a total of 47,006 feet, or a little more than 3.8 per cent, was removed. The latter renewals being mainly due to the necessity of putting our mains in the proper condition ahead of paving.

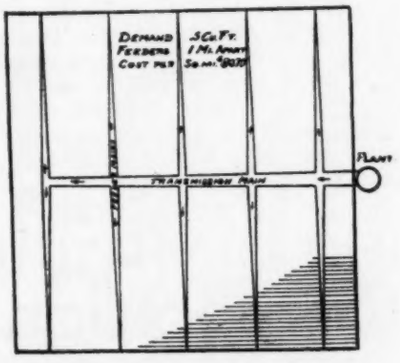
You will note there has been some 3½, 5 and 7-inch wrought iron mains removed, this being in each instance acquired mains, the year of their installation not being known, but it is presumed that they were in the ground at least 30 years previous to removal. The reason for their removal was due to the fact that, in most cases, when the streets were to be paved with a concrete paving, they were examined and found to have deteriorated considerably from combination of soil and electrolysis corrosion, which made it seem better to make these renewals rather than to run the risk of leaks in the near future.

Previous to 1913, we were purchasing pipe which was supposed to be wrought iron pipe for all high pressure work. Since that time, however, we have substituted steel pipe.

Our records do not show that any cast iron pipe has been removed due to electrolysis corrosion, nor does any service taken from cast iron pipe laid with cement joints show any electrolysis corrosion so far as it is known to date.

High Pressure in Two-Inch Pipe

Some of the discussion following last year's paper indicates that some engineers assume that, if two-inch pipe is used, high pressure must of necessity be utilized to make it serviceable. The distribution design described in last year's paper is, nevertheless, a low pressure design. There is an economy, however, in going to higher pressures and to determine just how high a pressure should be utilized and just what the relative economy of different distribution designs would be, there is presented here a series of high pressure designs, for various demands, using different size distribution mains and in all cases utilizing the pressures which would make the system a minimum cost. For this study, an area of substantially 5 miles square was assumed, the manufacturing plant being on one side as shown in following map.



Because the different size pipes are most economical with different pressure drops per thousand feet, the total pressure required on these distribution systems is not always the same, and, therefore, it is necessary to compare the different systems on an annual cost basis of which the annual cost of pumping is a part.

Conclusions

In the first place, 2-inch is more economical than 1¼-inch for demands greater than 1 foot per lineal foot, and more economical than either 1¼ or 4-inch for demands up to 8 feet. For 16 feet demands, it is only 9 per cent more expensive than 4-inch, so that it seems to be a most adaptable size, covering a range in the ratio of .5 to 16.

Second, we have for 2-inch distributors, on half foot demand, a distance between feeders of from 1 mile to 2 miles. The maximum variation in the cost per square mile per year is from $7,860 to $8,070 or less than 3 per cent. Numerous instances are shown where the spacing between feeders can be varied over a considerable range with very little variation in the cost per square mile per year, which means that this system of distribution is very flexible and adaptable to the varying conditions in the city.

The economical pressure drop in 2-inch distributors with one exception seems to be between 18 and 20 inches for all demands. The economical pressure drop in 1¼-inch distributors seems to be about 40 inches; the economical pressure drop in 4-inch seems to be much more varied.

The power cost is not half of the total annual cost but varies between about 18 per cent for 2-inch mains with half foot demands to 40 per cent with 2-inch mains on 16 foot demands.

Size of Pipe

The sizes of pipe in the feeder mains vary somewhat with the demand, but, nevertheless, show a considerable uniformity. For example, the most economical arrangement for 2-inch with half foot demands shows feeder sizes from 2-inch to 12-inch. With 2 foot demands from 3-inch to 16-inch; 4 foot demands 3-inch to 16-inch; 8 foot demands 4-inch to 20, and 16 foot demands 4-inch to 20. This is significant because it shows that the feeder installed, when the demand is small, will be adequate for a very large growth in demand.

Conclusion

In conclusion, our investigation shows, first, that cheaper distribution mains will give equivalent service without individual regulators. In particular, that on all but a small fraction of any distribution system, 2-inch distributing mains can be used without regulators to give the same service that larger mains would give, and at a fraction of the investment costs.

Second—That the maintenance on distribution systems using steel pipe is very small. The data shows that the total renewal cost is only a small fraction of the difference in interest charges between 2-inch steel and the usual cast iron mains.

Third—That the capacity of distribution systems, using cheap distribution mains, can be readily increased without making any part of the system obsolete. In particular, using 2-inch steel pipe for distributing mains, the capacity can be carried to 4 cubic feet per hour per lineal foot of main, at less total cost than with larger mains, and by utilizing efficient pressure, this capacity limit can be increased to 8 cubic feet per hour per lineal foot of main.

Fourth—That with the increasing cost of pavements, the location of mains at some other place than under pavements must be given careful consideration by gas companies, both for economy and to protect themselves from unwise legislation.

(Note: In the original report, which will be found in the Proceedings of the American Gas Association, there were many tables and diagrams which are not included in this transcript of the report due to lack of space.—Editor.)

Report of Sub-Committee on Testing and Valuation of Gas Oils

The sub-committee has directed its efforts along the following lines:

1st: A study of laboratory gasification apparatus,* wherein gas oil is subjected to cracking in an atmosphere of blue gas under controlled conditions and the resultant products measured.

2: Cooperation with the American Society for Testing Materials for the purpose of formulating standard methods for the testing of gas oils.

Test of Gasification Apparatus

Three samples of petroleum were forwarded to five gas companies' laboratories having gasification apparatus with the request that these be tested in accordance with specified conditions with the gasification apparatus at hand. It was the purpose of these tests to determine what degree of concordance might be obtained with apparatus varying in design. The results of these tests showed very wide variations among the several investigators and it is the opinion of your Committee that before this test can be standardized a considerable amount of study must be given to both the design and operation of the apparatus. Each of the companies equipped with laboratory gasification apparatus reports that it is of considerable assistance in determining the relative gas making value of gas oils and it seems probable that the variations found in this series of tests may be attributed to the fact that each laboratory gasification apparatus has been designed and is operated to give results comparable with the particular company's works operation, which would be affected by local standards of quality for gas, type of gas making machine and a number of other variables. Your committee recognizes the desirability of obtaining more direct measurement of the relative gas making value of gas oils than is furnished by the usual laboratory tests and believes that further study should be directed towards standardizing the laboratory gasification apparatus.

Cooperation With American Society for Testing Materials

This committee has cooperated actively with a Sub-committee of Committee D-2 on Pertleum Products and Lubricants of the American Society for Testing Materials during the past two years, in studying methods of testing gas oils. As a result of this cooperation proposed methods of testing gas oils were presented to the society at its last annual meeting and were adopted as Tentative Standard.

For those who are not familiar with the by-laws of the American Society for Testing Materials, it is worthy of mention that at least one year must elapse before a "Tentative Standard" can be voted upon for adoption as "Standard" and during this period criticisms of the Tentative Standard are invited. It is therefore important that gas companies consuming gas oils give careful study to these Tentative Methods during the ensuing year and submit their criticisms to the Chairman of this Sub-committee, in order that they may receive careful consideration before the methods are presented for adoption as standard.

W. H. FULWEILER,
R. B. HARPER,
C. A. LUNN, *Chairman.*

Tentative Methods of Testing Gas Oils as presented to American Society for Testing Materials were appended in the original report.—Editor.)

*Gas Chemists' Handbook, Second Edition, page 66.

Graphic Determination of Steam Data and Factors of Evaporation

Graphical method of finding factor af evaporation and total heat in steam

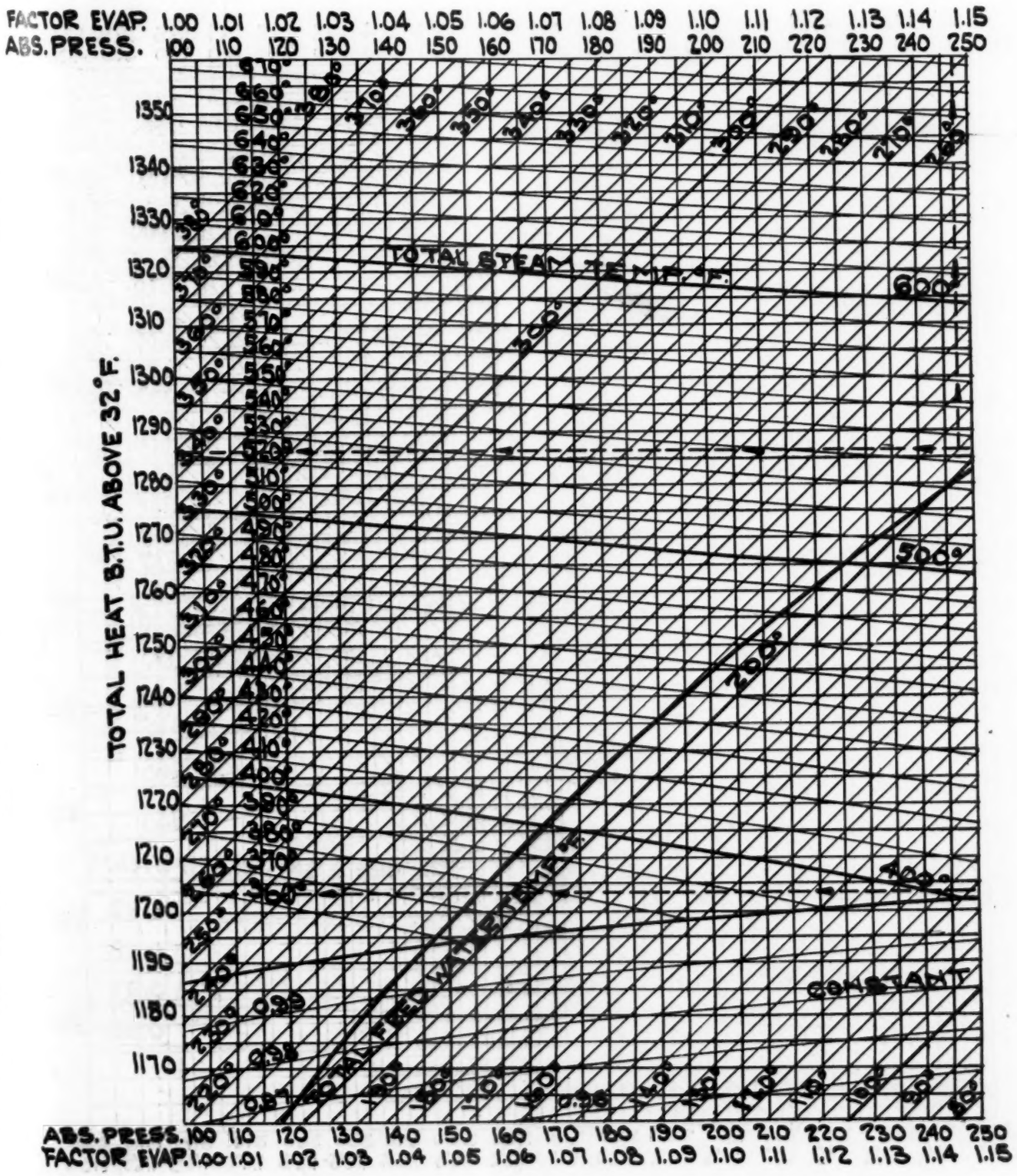
THE chart shown may be used for determining factors of evaporation and general steam data pertaining to boiler room practice which, of course, does not deal with entropy, without the further aid of steam tables or calculations from the usual formulae. Results obtained during the six months' general use of the chart have been entirely satisfactory and well within the limits of permissible error.

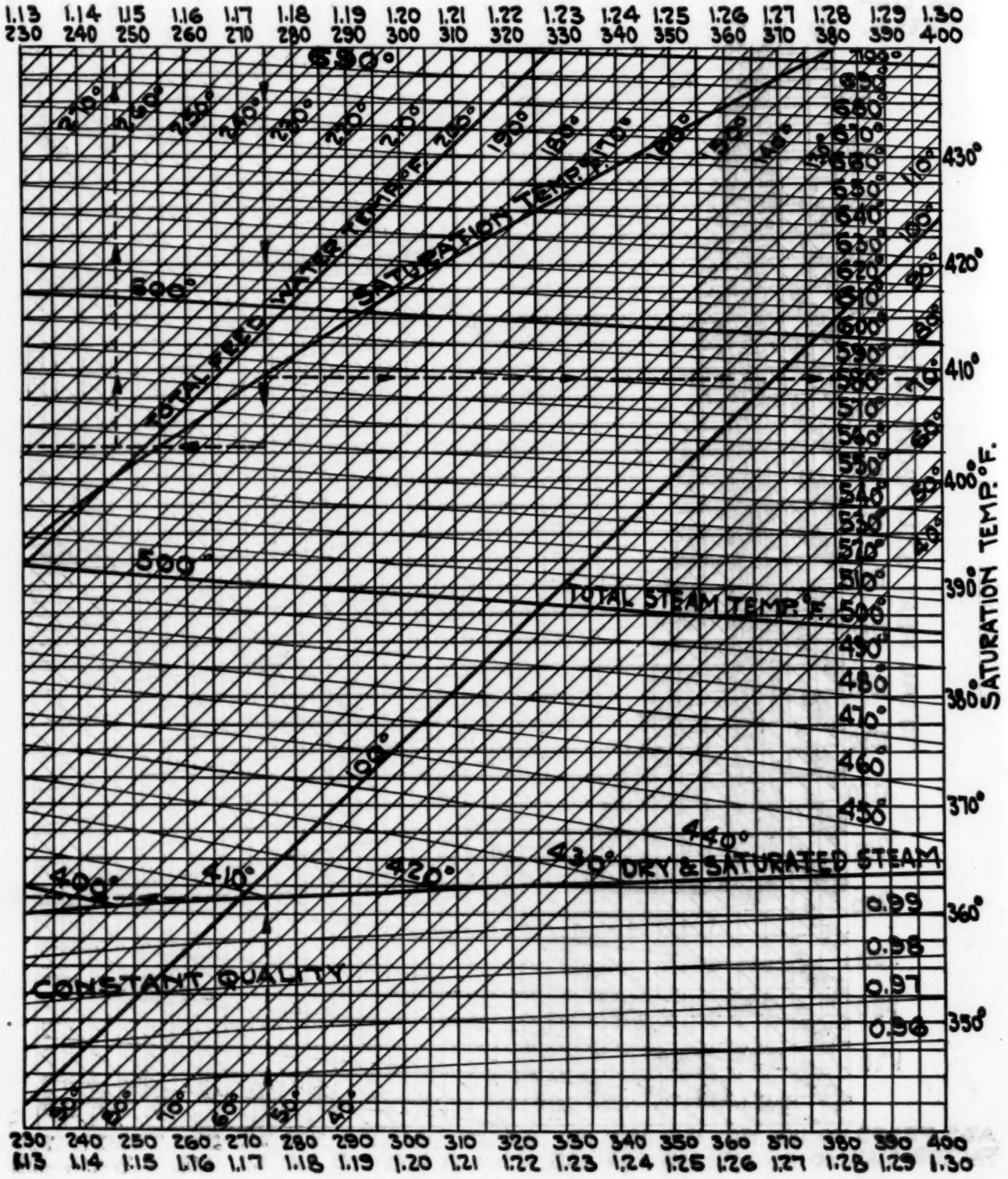
Basis of Chart

The chart is based on total steam and feed water temperatures of the Fahrenheit scale and has been plotted from Marks and Davis tables of saturated and superheated steam. The feed water temperature lines reflect the specific heats as given in the steam tables and, therefore, preclude the necessity for the usual correction of thermometer readings for heat above 32 deg. F. when obtaining factors of evaporation. In other words, these lines are designated as total feed water temperatures and plotted from the corresponding specific heats for direct determination of factors of evaporation. It will be noted, from the chart, that total steam temperature lines have only been carried down to saturation line inasmuch as the relation between pressure and temperature is the same for wet steam as for saturated, since the quality does not affect the temperature.

Saturation Temperature Curve

The auxiliary saturation temperature curve with scale on right hand margin has been added to fa-


FACTOR EVAP. 1.00 1.01 1.02 1.03 1.04 1.05 1.06 1.07 1.08 1.09 1.10 1.11 1.12 1.13 1.14 1.15
ABS. PRESS. 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250
TOTAL HEAT B.T.U. ABOVE 32°F.
1350
1340
1330
1320
1310
1300
1290
1280
1270
1260
1250
1240
1230
1220
1210
1200
1190
1180
1170
TOTAL STEAM TEMP. F.
600°
500°
400°
CONSTANT
ABS. PRESS. 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250
FACTOR EVAP. 1.00 1.01 1.02 1.03 1.04 1.05 1.06 1.07 1.08 1.09 1.10 1.11 1.12 1.13 1.14 1.15


1.13 1.14 1.15 1.16 1.17 1.18 1.19 1.20 1.21 1.22 1.23 1.24 1.25 1.26 1.27 1.28 1.29 1.30
230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400
TOTAL FEED WATER HEAT IN B.T.U.
SATURATION TEMPERATURE
TOTAL STEAM TEMP. °F.
DRY & SATURATED STEAM
CONSTANT QUALITY
SATURATION TEMP. °F.
430°
420°
410°
400°
390°
380°
370°
360°
350°
0.99
0.98
0.97
0.96

cilitate more accurate reading of saturation temperatures than could otherwise be determined without great care in reading up from lower absolute pressure scale to line of dry and saturated steam and approximating the temperature at saturation from relative location with respect to diagonal temperature lines. The pressure and temperature ranges are broad enough to include everything from the small low quality steam heating plant to the latest economizer practice involving high pressure and superheats. Abscissae are absolute pressures and evaporation factors. Ordinates are total heats, B.T.U. above 32 deg. F. on the left hand scale and saturation temperatures deg. F. on the right hand.

Example No. 1

Numerous combinations may be worked in solving problems in heat content, factors of evaporation, etc., and the use of the chart may, therefore, best be illustrated by examples.

Example No. 1 as shown on the chart assumes an absolute steam pressure of 275 lbs. with 140 deg. superheat and 205 deg. feed water temperature. It is desired to know the factor of evaporation for these conditions. The chart indicates the dotted line starting at 275 lbs. absolute pressure on the top scale and dropping vertically to the saturation temperature curve from which a line horizontally to the right indicates a steam temperature of 409.6 deg. at saturation, on the right hand scale. By adding to this figure the superheat, a total steam temperature of 549.6 deg. F. is determined. Returning to the point where the dotted pressure line intersects the saturation temperature curve a line is dropped to a point corresponding to the total steam temperature or 549.6 deg. Projecting horizontally to the left hand scale, the total heat may be determined if desired, which is 1,286.3 B.T.U. To determine the factor of evaporation, however, the heat content of the steam need not be read but, instead the horizontal line is stopped at the oblique 205 deg. feed water and then continued up vertically where 1.1473 is determined as the factor of evaporation for the conditions considered.

Example No. 2

Example No. 2. Assume absolute steam pressure of 275 lbs. with no superheat. Without further data it is desired to know the total heat content of the steam at this pressure.

As exemplified on chart, start at 275 lbs. on the lower absolute pressure scale and follow up to the saturation line. From this intersection continue horizontally to the left hand scale where 1202.9 B. T. U. is determined as the total heat above 32 degrees F. at this pressure.

Example No. 3

Example No. 3. Assume an absolute pressure of 140 lbs., .98 quality steam and 170 deg. feed water temperature. Determine total heat in steam and factor of evaporation. On bottom absolute pressure scale find 140 lbs. Read up to .98 quality line and left horizontally to total heat content at 1174 B. T. U. Return to point of intersection of .98 quality and 140 lb. pressure lines and continue right horizontally to the 170 degree feed water temperature line, then down to factor scale where 1.0677 is determined as the factor of evaporation for these conditions.

Flexibility of Curve

A fair working knowledge of the chart may be obtained from the foregoing examples. It then rests with the individual, in his ability and ingenuity in applying the various combinations in the solution of problems, to demonstrate further its flexibility and worth.

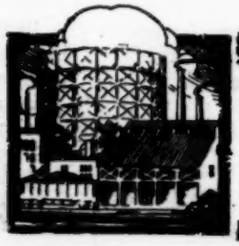
Cooling Coke

British Patent No. 173762 has been issued on a process for cooling incandescent coke, in which an apparatus is used wherein a gaseous agent is forced through a chamber containing the coke. The cooling agent is preferable in the form of a neutral gas which passes in a cycle over a heat-exchange device.

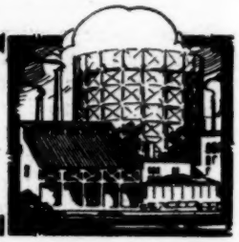
The cooling chamber provided at its lower end with a discharge hopper, and also with an inner hopper arranged within the chamber above, and coaxial with the discharge hopper, thus forming an annular chamber between the two hoppers, into which the cooling gas is admitted. Thus the inlet for the cooling gas is protected from becoming choked, and a uniform upward flow of gas through the coke is ensured. This arrangement enables the coke to be discharged in layers.

To ensure a central discharge from the lower hopper, even when the discharge opening is partially closed, two or more slides are disposed horizontally below the outer hopper; these slides being arranged symmetrical to the axis of the hopper. To prevent the core or central portion of the charge within the upper part of the chamber falling prematurely into the discharging hopper, a central check or baffle is provided so as to compel the charge to descend in a uniform manner.

The cooling of the coke is effected progressively from the bottom, layer by layer, and in such a way that by the time the lower layers have been cooled, the upper layers are still in an incandescent state. The cooled coke may be withdrawn from the chamber gradually; and in consequence it is possible to charge the chamber gradually with fresh coke.



NEWS OF THE GAS INDUSTRY



Convention Ends with Fun and Frolic

Steeplechase Pier a Playground for the Gas Men

"Syd"

Forgetting for the evening all the problems of their respective businesses and throwing dignity to the wind, about a thousand gas men, their wives, sisters and sweethearts, returned again to clown suits, rompers, popcorn and those things which we remember so pleasantly in the days of our childhood.

Sheeplechase Pier and all of its attractions was turned over to the American Gas Association members for the evening. The barkers were gas men, the ballyhooers were gas men and the "paid frolickers" were gas men. The evening was just one howl, one shout, one laugh after another.

When the guests entered the turnstile they were greeted by the usually dignified W. J. Clarke of Mount Vernon, Chairman of the Entertainment Committee. Mr. Clarke was attired in a broad-striped, red and black clown costume, clown white on his face and streaks of blue and green paint spread generously over his countenance. He had a megaphone in his hand and urged the guests not to take themselves too darn seriously. Before the amazement of Mr. Clarke's makeup had died away a strong gust of wind sent your hat flying across the pier and your wife's skirt tried to get away from its moorings. When you picked up your hat you found yourself looking into a freak mirror. You were not quite sure it was you because, while the face looked slightly similar, it was five feet wide and two inches deep and your body was spread from the Breakers to the Ritz. Laughingly you looked into the next mirror to be sure you were still you, and in the second one you were as tall as Curfman and as thin as Gould.

"The Convention Mixer" next attracted your eye. It was a smooth, revolving platform, deep sunk in a bowl. In the center was perched E. J. Cooney and around him the seventeen New England farmers. The disc began to revolve and as the motion became faster the riders began to slip. One by one, they skidded off the polished surface, slid down the inclined sides and held on for dear life. Cooney, alone and supreme, remained perched on that revolving disc. His unsuccessful companions, jealous of his agility, tried to scramble back and pull him off. As they approached him Cooney gave each a gentle push, and off they slid again. The prize was his, a victory well won, and Cooney modestly received the tribute to his prowess—a hot dog, presented on a French roll and decorated with German mustard.

Next came the "Public Relations" bridge. The floor looked smooth, the pathway unbroken, the railings safe and your passage over it seemed a very safe and easy trip. But — the moment you stepped on that "Public Relations" bridge it began to buck like a bronco, throw you from side to side, and if your underpinnings were not very steady you probably finished the trip on your ear. C. E. Bartlett, dressed in a yellow satin clown suit, with a makeup that was very amusing, stood at one side and laughed his head off at you.

Then came the "Shaker Screen." It also looked easy, but when it did finally release you, you realized that you had gotten more exercise in three minutes than you were used to getting in a week.

The quietest place on the pier was "The Complaint Desk." It was covered with a cloth, the lights were out and there was no attendant. Its cold and gloomy appearance brought a howl of laughter from every gas man who saw it.

After that came the slide. A chute of polished oak, waxed until it shone under the many colored lights. Up you climbed, flight after flight of steps, until the top was reached. Arm in arm, you

perched upon the brink, a shout, a push from behind, and suddenly you shot through space and down the incline at a speed reckoned at one hundred and twenty miles an hour. The person next to you was sliding feet first, you were sideways and the girl just back of you had her hat-pin in your ear. This slide was called "The Three Part Rate." The higher the rate, the faster the drop.

You then noticed, for the first time, that almost everyone was in a carnival suit, varied colored rompers, grotesque in design; so you, too, hurried to the booth and donned one. The minute you had your clothes covered with these fancy overalls something came over you. You wanted to try everything, you became a daring, don't-give-a-darn frolicker, and you not only had a whale of a good time yourself but your antics made the onlookers scream with laughter.

Suddenly the music from an old-fashioned hand-organ floated to your ears. Revolving lights attracted your eye, and you hurried to the "Rotary Meet-Her," the carnival merry-go-round. Proud as a kid, you climbed on your wooden horse, a wondrous steed, of hue unusual, with trappings of silver. Your wife, not so daring, seated herself in the chariot of ivory and gold, with plush cushions of royal purple. A whistle blew, "Yes, We Have No Bananas" floated out on the ocean breeze, and round and round you spun, happy, jolly, a boy again, back in the old home town.

"Candle Power" looked quite a promising fun-maker, but IT WAS OUT OF USE. The joke was on the gas men.

One of the most popular amusements was "The Fuel Pile." Popcorn, peanuts, red lemonade and hot dogs were there for the asking and within a very short space of time everyone was munching on some favored dainty.

"Commission Regulation" was a maze of doubt and indecision. It had delays and obstructions, backsets and disappointments. You started in with a great deal of enthusiasm, but came out tired and discouraged.

"Overhead Reducer" was another popular amusement. You climbed a fifty-foot ladder, slid down an incline, at the bottom of which was a bowl. You hit the bowl at a terrific rate of speed and spun around several times before you could stop. As you lay flat on your back, gasping for breath, some one threw you a rope and you climbed back to safety and saneness.

Just as you had made up your mind that you had had enough, Jake Jones and Sarah came along. Jake's suit was green with red polka dots and Sarah's rompers were black and red. They were on their way to the revolving barrel and insisted that you go with them. The barrel was a long cylinder revolving at a low rate of speed. The people walking through it were awfully awkward, the thing was easy, if one would only use a little brains. You would show them exactly how easy it really was. With shoulders thrown back and an air of confidence about your whole bearing, you took a step or two, and a smile spread over your features. Certainly it was easy: you had known it all the time. All you had to do was use your head as well as your feet. Suddenly your head began to revolve. Your body was facing one way, but your nose was pointed in the opposite direction. One wall of the cylinder kept getting off to one side and your feet refused to follow one another. You steadied yourself with your hands, and then your breakfast, lunch and dinner began to get mixed. A squirrel in a revolving cage could have had a good time—but you were a nut—not a squirrel. As you emerged from the hateful thing the rest of the gang told you how easy it was—to make a fool of yourself.

President Klumpp passed you. You were not quite sure it was President Klumpp. It couldn't be that man in the blue overalls. But it was, and he tried out every amusement on the pier and finished up by dancing until the lights were put out and an attendant shooed him back to his hotel.

Burton Smart had more fun than a ten-year-old kid, and Ed. Bauer took a chance of breaking his neck every five minutes. At 12 o'clock he was still going strong, with his neck almost intact.

Charlie Persons, his blonde hair a decided contrast to his dark clown suit, romped and frolicked all over the place, the petty cares and troubles of the convention a thing of the past.

One of the most amusing things of the evening was the fit of the garments worn by the ladies. Somehow or another, the tall ladies all drew short rompers and they kept trying to make them stay down around their shoe-tops. The small ladies were given large suits and their escorts were kept busy trying to find their fair ones, who kept continually getting lost in one arm or one leg of their rompers.

In the ball room of blue and gold, Lenihen's orchestra was playing tunes that just wouldn't let your feet behave.

One by one, the merrymakers drifted into the ball room and danced. By 11 the balance of the

pier was almost deserted, but the ball room was crowded. As if by magic, clown suits and rompers disappeared and the gas men and their ladies were attired in evening dress.

How they fox-trotted and waltzed, dignified men and gray-haired mothers, middle-aged couples from small towns and wise youths and flappers from New York. A mixing of age and youth, simplicity and sophistication, all upon the common level, worshiping at the throne of Terpsichore.

During the dancing, pleasant jest and jibes floated across the floor and between dances small groups gathered here and there and recounted the fun of the evening.

And thus ended the Fifth Annual Convention of the American Gas Association—a Convention that was bigger and better, larger and finer, in every way, that any which preceded it.

No effort had been spared, no deed undone by those in charge, to make it a success, and the rank and file of the membership were unanimous in praising the work of all those who had a hand in it.

There will be other conventions. They will be well attended and the members will enjoy them—but the 1923 convention will stand out as a high light, an incentive to greater effort, a week of business and fun, a week of happy smiles and glad hand-shakes, a week of good fellowship and of brotherly love.

And so, with light heart and pleasant memories—Au Revoir.

EXHIBIT SPOTLIGHTS.

The mecca of all the "old timers" at the convention was the Lovekin Water Heater Co. booth. The reason: A photo of the A. G. A. convention delegates, taken on the old Capitol steps in Washington, D. C., in 1884. Groups of the old fellows critically examined every figure, searching for some familiar face, and many were the cries of exultation when some veteran gas man found himself as he was 39 years ago.

J. Scott Fowler remarked: "The picture attracted more attention than their display of Lovekin Heaters" (which was very admirable). Still, it had the effect of accentuating the four-score years' service they have devoted to the gas industry, for among the members are two, Mr. Fowler and Mr. Deily, both connected with the original firm at that time.

"Bill Smith," Chauffeur of the "Superior" Service Cleaner.

Another conspicuous figure is Mr. Sanderson, who was editor of The American Gas Journal in 1884.

A device to enable the gas company to demonstrate to the consumer the method of reading the index of a gas meter is shown in the booth of D. McDonald & Co., of Albany, N. Y.

This device is usually displayed in the office of a gas company and will help tremendously in solving the "mystery" of meter reading.

If every gas company representative saw the Complaint Meter, on view in the booth of the Maryland Meter Company, there would be better feelings existing between their company and their customers. This meter is so constructed that its clock-work runs for one week, and when set in the house of a consumer will absolutely record on the paper chart of the cylinder the exact amount of gas consumed, marking the hours gas was consumed, either day or night. This makes such a convincing record that the consumer cannot dispute the facts shown, and learns to his own satisfaction that his bills are correct.

CONVENTION NOTES.

W. A. Allison, consulting engineer, Philadelphia, was one of the last to leave Atlantic City. He had enjoyed the convention so much he hated to part with the Board Walk and the Steel Pier.

"It's been a great convention," said Mr. Allison; "the spirit of friendship and good fellowship that existed here made the convention a great success, and I always go back home a better gas man."

"Joe" Taylor Turns the Tables

Friend's Jokes Go a Little Too Far, and an Innocent Suffers

Many amusing things happened during the Convention, but none funnier than Joe Taylor's experience.

It was two o'clock in the morning and Joe was sound asleep in

his room at the Traymore. He had been on his feet all day extending the glad hand to visitors and extolling the merits of his ranges, so his sleep was peaceful and happy. Suddenly he was awakened by the jingle of the telephone bell. He jumped out of bed and answered it. "Is that you, Joe?" came a familiar voice over the wire. "Yes, what do you want?" answered Joe. "Nothing," answered the voice, with a laugh. "I just wanted to know if you were awake." Bang, up went the phone and Joe crawled back into bed, cursing his tormentor for his perverted sense of humor.

In about half an hour, just as Joe had gotten to sleep again, the phone rang. He answered it and another one of his friends asked him some fool question. Joe hung up the phone on him and went back to bed in disgust.

At 8 o'clock Joe was again awakened by the sound of his telephone bell. The shades in his room were down and he didn't realize it was morning. Thinking another one of his friends was going to kid him, he made up his mind to turn the tables.

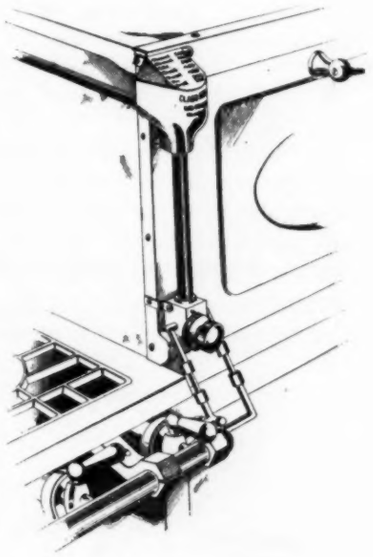
"Hello," said Joe. "Hello," came back a nice friendly voice, "Is that Joe Taylor speaking?" "Yes," answered Taylor, "and who is that?" "This," answered the voice, "is Al Crane and I've come clean from California." "I'm glad you've come clean," said Joe; "and did you bring the dog with you?" "What dog?" answered the voice. "If you're Crane from California you know about the dog," answered Joe. Silence for a second. "Yes, I have the dog," said the voice. "Fine," answered Joe, "Is there a collar on him?" "Yes," said the voice. "Is there a chain to hold him by?" asked Joe. "Sure there is," said the voice. "Then," said Joe, "take hold of the chain, swing the dog around three or four times and throw him in the ocean." Joe hung up the phone and felt satisfied. He'd handed it right back to some one.

At 10:30 when Joe walked into his exhibit on the Steel Pier there awaited him a very charming gentleman, who presented a letter of introduction. The letter introduced Mr. Crane and was signed by H. R. Basford, President Pacific Coast Gas Association. Joe began to apologize for his talk over the phone and explained why he had acted as he did. "That's perfectly all right," said Crane. "I understand, and to prove that there is no hard feelings I've brought you a little present." He reached behind a box and brought out a dog, a collar and a chain. "I didn't have the heart to throw him in the ocean," said Crane, "so I brought him to you. You do it yourself."

Then they went out on the Boardwalk and had their pictures taken. All three of them have collars, but the chain is on the dog.

AN IMPROVED GAS THERMOSTAT.

The Claus gas thermostat is an apparatus which combines in it ease of maintenance, economy and safety, according to claims of the inventor, who kindly explained the



details of this device to the reporter of the Journal at Atlantic City.

Accuracy in such an apparatus is essential and may be obtained when the motion of the thermostat bringing it into play is carried out by a positive arrangement, not dependent on springs. The feature of the aforementioned device is the use of a telescoping revolving valve.

Furthermore, there is the question of the maintenance of the instrument, which is an important consideration, particularly where

the parts of the appliances are subjected to high temperatures. In this particular case high temperatures do not prevail in any of the movable parts of the apparatus, which means that the maintenance of the same is very easy.

The cost of the thermostat is also an important matter and depends in part on whether or not it is necessary to use pipes and fittings in connecting the instrument to the gas stove. The improved thermostat is connected directly to the stove, a telescoping device being inserted as a connection between the instrument and the stove.

The final consideration in the design and use of the thermostatic oven regulators is the safety with which the device can be operated in such a manner that it may be used with perfect safety. All danger of gaseous explosions is eliminated.

H. V. Carlier, of Schaeffer & Budenberg, extending the glad hand.

CONVENTION JOTTINGS.

Joe Heckman, president of the American Mineral Products & Color Co., of Noblestown, Pa., was seen in earnest conversation with many gas men, and we presume Joe was telling them how to get rid of their purification troubles. Joe said he never had attended a meeting that was so full of pep and enthusiasm as this meeting of the A. G. A.

George Cressler, who keeps the wheels in the plant of the Stacey Mfg. Co., of Cincinnati, going around, was in daily attendance at the meeting, and never once was his genial smile missing. Unless George wears his clothes padded this year we are safe in saying that he is not on a diet.

Charlie Aarons, of Boston, has not missed an annual meeting of the gas men since he was old enough to start going to conventions. He has been under the weather for a while and his physician advised him to stay away from Atlantic City, but the temptation was too strong and he disregarded the advice and went to Atlantic City. The effect on Charlie of this wonderful meeting apparently did what his doctor could not do, and he is returning to Boston with the firm belief that the A. G. A. meetings produce more than orders to the men who are fortunate enough to attend them.

MAKE NOTE OF THIS.

On page 430 of the October 19th issue appeared a picture captioned "The First President of the Indiana Gas Association." The gentleman referred to is Mr. James W. Dunbar. We do not think that our printers at Atlantic City had anything special against Mr. Dunbar, but his name was marked on two sets of proofs and, in spite of that, it was omitted.

Dave Lambert, Lambert Meter Co., caught on the "fly," going home.

New Catalogs

The General Carbonic Co., 542 Fifth Avenue, New York, have issued a booklet entitled "Why the Hand Pump?" It refers to the clearing out both house and street service lines with carbon dioxide gas, liquified under pressure. The General Carbonic Co. states that the pressure of CO_2 gas can be released, regulated and adjusted to any regular pressure. Copy of the booklet will be sent on request.

The Brown Instrument Co., Philadelphia, Pa., have just issued Catalog No. 30, covering the Brown electrical indicating and reporting CO_2 meters. These meters are very well adapted for the measurement of CO_2 contained and the temperature of flue gas, and the catalog describes the principles of operation, installation, etc. It is illustrated with line plan cuts and half-tones.